SECTION 14631
50-TON NOG-1 CRANE

PART 1 - GENERAL

1.1 SCOPE

A. Description
1. This specification defines the requirements for the design, development, analysis, material procurement, fabrication, inspection, and testing of a 50-ton top running bridge crane (hereafter referred to as the "Crane") to the Spallation Neutron Source (SNS) facility for the Department of Energy's (DOE) site near Oak Ridge, Tennessee, USA. The Crane shall be constructed and tested in accordance with the "single failure proof" requirements to NUREG 0554 although it will not be licensed by the Nuclear Regulatory Commission.
2. The term "Purchaser" is used to refer to SNS. The term "Supplier" is used herein to refer to the crane manufacturer and their subcontractors.

B. Responsibilities
1. Purchaser Responsibilities - The Purchaser shall be responsible for the following:
   a. Completing the necessary runway rails and all related load path items that carry the crane loads including rails and support structure.
   b. Obtaining State and Local government permits and approvals, as required,
   c. Provide covered storage space on the specified delivery date.
   d. Site installation labor under Supplier's supervision including rigging, crane operation, field welding, decontamination, and other craft activities.
   e. Final load testing including test weights and rigging.
   f. Site coordinator to interface with Supplier's installation supervisor.
   g. Personnel safety oversight.
   h. Coordinate and control construction use of the Crane in accordance with NOG-7500.
2. Supplier Responsibilities - The Supplier shall provide the following:
   a. All components of the Crane as defined in this specification.
   b. All documentation as defined in this specification.
   c. Technical assistance during the installation of the Crane.
   d. Field inspection and testing during start-up and commissioning.
   e. Operator training.
   f. Technical assistance during the final inspection following construction use of the crane.

C. Qualifications To Bid
1. Bidders must have designed and built a minimum of ten (10) NUREG 0554 single failure proof cranes or NOG-1 Type I. The bidder shall provide references including current contact names of those who can attest to the bidder's claim in this proposal.
2. Bidders shall have an active 10CFR50 Appendix B or ASME NQA-1 quality assurance program. A list of companies and the contact persons who have audited the bidder's program in the past two (2) years shall be included in the proposal.

D. Warranty
1. The Supplier shall provide an unlimited warranty and guaranty for two years of operation following final acceptance. During this time, replace or repair at no additional cost, any item that fails to function properly because of improper selection or application of components or as a result of defects in workmanship, material, or design.

1.2 REFERENCES

A. Codes And Standards
   1. The Supplier shall meet or exceed the requirements of the codes, standards, regulations, and procedures, as currently published at the time of manufacture, referenced in this specification for the design, fabrication and testing of the Single Failure Proof Crane. In the event of conflict between the specification and the codes, the more stringent requirement shall govern.

B. Title 29 – Labor
   1. 10CFR 830.120 Quality Assurance
   2. 29 CFR Standard 1910.179, “Overhead and Gantry Cranes”
   3. 29 CFR Standard 1910.309, “OSHA Safety and Health Standards-Electrical”

C. Nuclear Regulatory Commission (NRC) Documents
   1. NUREG 0554, "Single-Failure-Proof Cranes for Nuclear Power Plants”
   2. NUREG 0612, "Control of Heavy Loads at Nuclear Power Plants"

D. American Society of Mechanical Engineers (ASME)
   1. ASME B30.2-1996, “Overhead and Gantry Cranes”, Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist
   2. B30.10 – 1993 “Hooks”
   3. ASME NOG-1, “Rules for Construction of Overhead and Gantry Cranes” to the extent referenced in this specification.
   4. ASME NQA-1, “Quality Assurance Requirements for Nuclear Facility Applications”

E. American Society of Testing Materials (ASTM)
   1. ASTM A325 – 1990, Standard Specification for High Strength Bolts for Structural Steel Joints (Revision A)
   2. ASTM B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

F. American Welding Society (AWS)
   1. D1.1 1998, “Structural Welding Code - Steel”
   2. A5.1-A5.30, “Weld Filler Metal – Applicable Edition”

G. Crane Manufacturers Association of America (CMAA)
   1. CMAA Specification #70, Revised 2000, “Crane Manufacturers Association of America, Inc., Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Traveling Cranes”.

H. National Electrical Manufacturers Association (NEMA)
   1. NEMA 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”

I. National Fire Protection Association (NFPA)
   1. National Electrical Code

1.3 REFERENCE DRAWINGS

A. The Crane shall be designed and installed in accordance with the following SNS Target Building construction drawings (Note: the crane is identified in the reference drawings as “BC-4”).

Title	Contract Drawing No.	SNS Drawing No
Overall Plan Level 3	A1.03.30	108030700-A8E-8700-A012
Building Sections	A3.30.31 A3.30.33 A3.30.35 A3.30.36	108030700-A8E-8700-A093 108030700-A8E-8700-A095 108030700-A8E-8700-A096 108030700-A8E-8700-A082
Crane Information	A9.30.31	108030700-A8E-8700-A121
Overall Crane Layout, Crane Levels	S1.05.30	108030700-S8E-8700-A014
Steel Elevations and Sections	S5.10.33	108030700-S8E-8700-A084

1.4 SUBMITTALS

Item Description	***Section***	***Supplier's Latest Initial Submittal Date***	***Review Period***	***No. of Copies****	***Purchaser Approval Required***
Quality Assurance Program or Quality Control System	3.4	With Proposal	N/A	1	Yes
Operations Manual	2.2B	Prior to shipment	1 month	3	No
Maintenance Manual	2.8B	Prior to shipment	1 month	3	No
Spare Parts Inventory Document	2.8C	Prior to shipment	1 month	1	Yes
Nameplate Drawing	2.9	5 months after award	1 month	1	Yes
Design Documents	1.5E	4 months after award	2 months	3	Yes
Test and Inspection Plan	3.3A	6 months after award	1 month	1	No
Test Procedures	3.3	6 months after award	1 month	1	No
Inspection and Testing Reports	3.3	Prior to shipment	N/A	1	Yes
Receiving Inspection Plan	3.3C.2	5 months after award	1 month	1	Yes
Packing, Shipping, and Handling Plan	3.1	5 months after award	1 month	3	No
Recommended Installation Procedure.	3.2.B	5 months after award	2 months	1	No
Certificate of Compliance	3.4A.3	Prior to shipment	N/A	1	No
Structural Analysis	1.5.B, D	4 months after award	2 months	3	Yes

1.5 DESIGN CRITERIA

A. Loads

1. The operational loads that shall be considered in the design of the Crane shall be those specified in CMAA #70. Seismic loads shall be those specified in ASME NOG-1 Section NOG-4136, subject to the following design inputs:
   a. Critical Loads
      1) Maximum Critical Load 50-tons
      2) Design Rated Load 55-tons
      3) Construction Load 50-tons

4) Component parts that are subject to wear and exposure shall be designed for 115% of the Design Rated Load in accordance with NUREG-0554 Section 2.2.

b. Impact Loads

1) Vertical Impact Load, Transverse Horizontal Impact Load, and Longitudinal Horizontal Impact Load shall be applied as specified in CMAA #70. The hoist load factor (HLF) shall be taken as 15% in the vertical direction per CMAA #70.

c. Seismic

1) The Crane shall be designed and analyzed in accordance with the seismic requirements for a NOG-1 Type I crane. The design shall be in accordance with NOG-1, NOG-4150 and NOG-4136 part (a) "Safe Shutdown Earthquake" (SSE) for the attached seismic design response spectrum.

B. Structural Analysis And Seismic Analysis

1. All structural components of the crane, including the runway rails and rail clips, bridge girders and end trucks, trolley rails and rail clips, and the trolley and its wheels, shall be designed for operating load combinations per CMAA #70 (Section 3.3.2.4) and for seismic load combinations "C" severe environmental loads and "D" extreme environmental loads per ASME NOG-1, Section NOG-4140.
2. The supplier shall determine the static load effects of the crane plus live load (including impact, if applicable) considering critical trolley positions on the bridge. The load effects shall be combined with the provided SSE seismic loads using the guidance of ASME NOG-1 Table NOG-4153.7-1. A parametric evaluation of all load cases designated in NOG Table 4153.7-1 may be used to determine the worst-case conditions for Crane for final analysis.
3. Attachments to the crane, including but not limited to motors, junction boxes, railings, grating, hoist and load blocks, etc. shall be evaluated for SSE seismic loading to ensure that the attachments do not become detached from the crane.

C. Structural Design Load Combinations and Allowable Stresses

1. The crane shall be designed for the load combinations given in Section 3.3.2.4 of CMAA #70. Stresses shall not exceed the allowable stresses given in Section 3.4 of CMAA #70.
2. The crane shall also be designed for the ASME NOG-1 Section NOG-4140 load combinations seismic load combinations "C" severe environmental loads and "D" extreme environmental loads. The ASME NOG-1 Section NOG-4300 design criteria shall not be exceeded for those load combinations. In this application SSE load combinations shall be considered with operating environmental allowable stress level in ASME NOG-1 Table NOG-4311-1.
3. Where allowable stresses are not specified for members and connections in CMAA #70 or ASME NOG-1, the allowable stress per the American Institute of Steel Construction (AISC) Manual shall be used for normal operating loads. The AISC allowable stress values may be increased by the factor 1.0 for OBE load combinations, and by the factor 1.6 for SSE load combinations.

D. Localized Analysis

1. Detailed calculations shall be performed for all structural connections used in the crane, including the trolley.
2. The structural integrity of the trolley rails, bridge runway rails, the rail clips, and the rail clip attachments shall be evaluated by a professional engineer.

E. Design Output

1. The Supplier shall prepare and submit a comprehensive package of Design Documents for approval in accordance with ASME NOG-1, NOG-7613.1.
2. English units of measure shall be used on all design calculations, drawings, material and specifications.

3. The design output shall include a summary of the forces applied to the building structure and the design evaluations made to accept/modify the elements in the Supplier's scope. Design output shall include a summary of the forces induced in the runway, the runway stops, and the structural steel supporting the runway for each load combination, and for bridge sliding effects. Proper consideration shall be given to the sense and direction of the forces and moments. The forces and moments shall be broken down by type (e.g., dead load combination, operating load combination, etc.). The design output shall be verified and approved.

PART 2 - PRODUCTS

2.1 CRANE REQUIREMENTS

A. Functional and Interface Requirements

1. Configuration and Essential Features.

Operating Load	50-tons
Duty Class:	CMAA #70 "Service Level D".
Runway Rails:	135 lb. ASCE

B. Operating Speeds

1. All drives shall be variable in five (5) steps with programmed acceleration and deceleration. The maximum speed for each drive shall be as follows:

Bridge Maximum Speed	150 ft/min
Trolley Maximum Speed	125 ft/min
Main Hoist Maximum Speed	7 ft/min
Main Hoist, No Load, High-Speed Option	10 ft/min

C. Operating Coverage

1. Maximum hook centerline approaches:

- North & South Side walls, Center of crane rail to hook	4'-0"
- East end wall crane stop to hook	8'-10"
- West end wall crane stop to hook	11'-6"
- Hook height above highbay floor	25 ft
- Hook travel	80 ft

D. Environmental Conditions

1. The Crane shall be designed for continuous operation in an in-door air environment with a relative humidity of 20-60% and the following temperatures:

a.	Maximum temperature:	100°F
b.	Minimum temperature:	65°F
c.	Ambient temperature:	85°F
d.	Maximum construction temperature:	110°F
e.	Minimum construction temperature:	32°F

E. Radiation

1. The Crane will not be exposed to significant radiation.

F. Crane Lifetime

1. The Crane shall be designed for a life of 50 years consisting of 40-years of operation followed by a 10-year hot cell decommissioning period; assuming periodic maintenance in accordance with the Supplier's recommendations and industry standards.

G. Coordination with crane air lock doors

1. The crane shall be designed to pass through the crane air lock doors.
2. The crane main lines shall be designed to pass through an opening provided in the crane air lock doors. The main lines shall be configured in such a way as to allow

the crane air lock door to operate properly and to maintain the required air pressure differential when the crane air lock door is in the closed position.

2.2 OPERATIONS

A. Construction Operations

1. The Crane will be used for initial assembly of the in-cell process systems during the SNS construction period. Use of the Crane will be governed by an agreement with the SNS project Construction Manager (CM) according to NOG-7430. After construction, an inspection will be undertaken by the Purchaser in accordance with NOG-7500 to qualify the Crane for permanent plant service.

B. Operations Manual

1. The Supplier shall provide an Operations Manual for the Crane. The manual shall provide information required for normal and off-normal recovery operations of the Crane.

C. Training

1. Training in three disciplines at various levels shall be provided by the Supplier for a maximum of ten people in each class: mechanical maintenance, electrical maintenance, operation. Operation training shall be detailed enough to ensure the operator a conceptual knowledge of the equipment as well as the actual hands-on experience of the workings of the Crane in their everyday environment. Mechanical and electrical maintenance will be detailed enough to enable the repair and maintenance of all components and subsystems. Lessons in safety, preventive maintenance, theory of operation, adjustment procedures, and troubleshooting will be included. Purchaser will supply classrooms and audio-visual equipment for on-site training. A complete set of all training documents and course aids shall be furnished at a minimum of thirty days prior to the scheduled commencement of training for review and approval. Minimum 8 hours per class is required.

2.3 MECHANICAL REQUIREMENTS - All mechanical components of the Crane shall conform to the requirements of NUREG 0554. Additional requirements are specified below.

A. Reeving

1. The Crane shall be double reeved and operate with a true vertical lift. The reeving shall be single failure proof.

B. Drives

1. Motors
   a. Drive motors (hoist, bridge and trolley) shall be specifically designed for crane service in accordance with NEMA standards, including the following features:
      1) Motors shall be totally enclosed non-ventilated (TENV)
      2) 480 volt, 3 phase, 60 cycle
      3) Inverter Duty – NEMA Design B
      4) 60 minute minimum time rating
      5) Class H Insulation (minimum)
      6) Maximum synchronous base speed of 1800 RPM
      7) Thermostats in all three phases

C. Motor Controllers

1. Drives shall be equipped with closed loop flux vector variable speed drives, specifically meeting the criteria of Section NOG-6417 and 6417.1 of ASME NOG-1. The drives shall provide stepped speed control with speed regulation capability in five adjustable steps. The drives shall include:
   a. Thermal Overload Protection.
   b. Short Circuit Protection.
   c. Phase Loss/Reversal/Under-voltage/Imbalance Detection.

D. Hoist

1. Single Failure Proof Requirements

a. The hoist shall be configured in accordance with ASME NOG-1, Fig NOG 5416.1-1 and shall incorporate single failure proof design components that prevent the following load drop scenarios.

1) Prevent and withstand overload condition assuming that limit switches don't work and/or rope damage from "two" blocking at highest motor RPM resulting in a load drop.
2) Prevent and withstand an overload condition from a “load hang-up” at any elevation.
3) Furnish the crane with emergency handling capability to safely remove the load in the event of power failure or an electrical or mechanical equipment failure.
4) All load carrying parts, except girders and walkways shall have a ratio of 5:1 safety factor minimum based on the ultimate material strengths and maximum stresses calculated to occur when the equipment is operated at its maximum rated capacity. The vendor shall determine what exact safety factor is necessary to withstand overload, load hang-up and two-blocking. The stress shall be less than 90% of material yield strength and shall take into account both stress from motor stall torque and rotational component inertia impact stresses.
5) Drive train monitoring to detect proper continuity of hoisting drive train between hoist motor and drum and safe shutdown upon discontinuity detection.
6) Cable misreeving detection system to shut down the hoist in the event that the hoisting cables are not winding into their grooves properly on the hoisting drum.
7) Prevention of uncontrolled load lowering that can occur in the interim period of time from detection of drive train failure to drum brake set to hold the load.
8) Drum overspeed protection due to failure in the hoist drivetrain from “freewheeling” drum or regeneration in the electric motor.

E. Travel Limit Switches

1. The upper and lower hoist travel limits shall be rotary-geared control circuit limit switches.

F. Final Over-travel High Limit Switch

1. The hoist shall be configured with power upper limit switch, as required by ASME NOG-1. These limit switches shall have early break contacts in the control circuitry that first actuate and stop the hoisting motion. In the event that the upper-geared limit switches and the control circuits fail to function, the power circuit limit switches shall directly interrupt power to the motor, setting all brakes and bring the hoist to a stop. The time between early break contact actuation and motor power lead (T-leads) contact break actuation shall be no more than approximately .25 seconds.

G. Hoist Brake Configuration

1. Hoist braking shall conform to the requirements of NUREG 0554 Section 4.9. The Crane shall have dynamic control braking and two holding brakes including a drum emergency brake. Each holding brake shall be rated for 150% of the full load hoisting motor torque, however, neither brake need be designed to the referenced AISE standard (see Section NOG-6422.1 (a) of ASME NOG-1.

H. Control Braking

1. Controlled braking shall be provided by the dynamic method in accordance with the requirements of CMAA Specification 70.

I. Drum Emergency Brake
   1. The hoist drum shall be equipped with a spring set air or hydraulic release disc or band brake. The air or hydraulic power unit shall be capable of lowering the load under emergency conditions without electrical power.

J. Manual Load Lowering
   1. A method for emergency load lowering shall be provided. Additionally, battery powered speed measuring devices shall be provided, which can be calibrated to show lowering speeds in order to ensure that lowering can be accomplished in a controlled and safe manner.

K. Load Scale System With Overload Limiting
   1. The hoist shall be furnished with a load measuring device, which senses the lifted load (independent of any electronic sensing features of a flux vector hoist control) to measure lifting loads. The maximum measurement should be 62.5 tons of lifted load to provide a margin for acceleration of the lifted load.

L. Bridge and Trolley
   1. Bridge and Trolley Travel Limit Switches
      a. The bridge and trolley shall be equipped with dual limit switches at the end of each travel. The first switch should signal the drive to slow bridge or trolley motion and the second should stop the bridge or trolley.

M. Trolley and Bridge Brakes
   1. Trolley and bridge brakes shall be spring set, electrically released disc type, integral to the motor.
   2. All brakes shall be self-adjusting to compensate for lining wear.

N. Hook
   1. The hook shall be a single barb configuration. The hook shall be manufactured from forged or cast steel and shall have a 10:1 safety factor based on ultimate strength of the hook material.
   2. The hook shall rotate manually.
   3. The hook shall be provided with spring activated stainless steel safety latch that shall be clamped to the hook shank and be removable.
   4. Nondestructive testing of the hook shall be performed in accordance with the requirements of ASME NOG-1, Section 7000. A proof test shall be performed in accordance with ASME B30.10. Hooks and mating nuts shall be load tested at 200% of rated load.

2.4 WELDING REQUIREMENTS

A. Welding Standard
   1. All structural steel welding shall be performed in accordance with AWS D1.1. Only personnel qualified in accordance with the Supplier's welding procedures shall perform welding at the Supplier facility.

B. Procedures and Identification
   1. Non-prequalified weld procedures must be supported by a procedure qualification test report. Fabrication drawings shall show all shop welds. Weld procedures are to specify if preheat and postweld heat treatments are required.

C. Non-Destructive Examination
   1. All weld joints, identified in NOG-1 Table 7200-1, whose failure could result in the drop of a loaded cask shall be non-destructively examined. If any of these weld joint geometries should be susceptible to lamellar tearing, the base metal at the joints shall also be non-destructively examined.

D. Weld Process

1. Covered electrodes for shielded metal arc welding (SMAW) shall be controlled, stored, and conditioned per the requirements of AWS D1.1, Section 5.3. In addition to the requirements of AWS D1.1, all welding materials shall be stored in a clean, dry area that is maintained at a temperature between 40 degrees F, and 140 degrees F. The materials shall be traceable at all times during storage, handling, and issuance, to their appropriate lot number.

2. Only low-hydrogen-type electrodes shall be used as weld filler metal on carbon and low alloy steels if shielded metal arc welding (SMAW) is the welding process selected for production.

E. Filler Metals

1. Weld filler metals shall meet the requirements of the applicable, AWS A5.1-A5.30, Filler Metal Specification. Weld filler metal documentation required shall be a certificate of conformance from the weld filler metal manufacturer showing typical test results.

2.5 ELECTRICAL REQUIREMENTS

A. General Requirements

1. Power shall be supplied to the crane via a 3-phase with ground dual-shoe collector system. The Supplier shall provide all components of the collector system.
2. All electrical control components shall be of heavy-duty design suitable for operation at 120 volts AC, and be provided in accordance with Section NOG-6000 of ASME NOG-1.
3. A mainline safety switch shall be provided near the bridge collectors, on the crane, to disconnect the entire power supply to the crane. This switch shall be provided with a means for pad- locking in the off position, consistent with the requirements for lockout tagout.
4. Upon loss of power or manual actuation of any of the emergency stop buttons, all crane motions shall come to a stop and all brakes shall set.
5. Upon actuation of the emergency stop buttons, all power shall be removed from the crane.
6. Electrical enclosures shall be NEMA type 12.
7. The power/control system shall be designed so that a single failure of the system will not cause a load drop. Specifically, the crane electrical components shall meet the requirements of ASME NOG-1 Section NOG-6110. Failure of one of the three phase power leads shall not result in a failure of the crane to hold the load and at the same time result in a failure of the crane brake to set.
8. Resistor banks shall be mounted and located in a manner that allows free airflow for proper heat dissipation. Guards shall be installed in accordance with OSHA standards.

B. Crane Wiring

1. All crane wiring shall be installed in intermediate galvanized metal conduit, except short lengths, 3 ft. or less, to resistors, collectors and motors where flexible seal tight conduit shall be used. The conduit system shall be supplied including all necessary fittings required to achieve NEMA 12 rating.
2. To allow for easy troubleshooting, all panel wiring shall be labeled to match the wiring diagrams utilizing "Brady" markers. Each wire shall be continuous between terminals; no splices are permitted.
3. Panel control wiring shall be a minimum 16 AWG copper, type SIS/XHHW. This type wire shall be run from terminal strips to each respective discreet component. Spare terminals equal in number to approximately 10% of the active terminals shall be provided to allow for future modification.
4. Power wiring shall be minimum 14 AWG copper with Class B Type stranding in accordance with ASTM B8.

5. Trolley conductors shall be contained in a festoon or power track type system. The system shall include all necessary mounting hardware, as well as all conductors required to connect the bridge to the trolley.
6. Wiring shall be in accordance with NFPA 70, Article 610. (PVC wire insulation shall not be utilized).

2.6 CONTROL REQUIREMENTS - The Supplier shall provide a control system in accordance with NEMA ICS-3-442 and OSHA safety requirements.

A. Operator Control
1. Radio Control
a. The crane shall be supplied with a Cattron, Series AT radio control system, or approved equal.
b. Control pendant shall be supplied with quick disconnect for use if radio control system fails.

B. Controller Configuration
1. Two “belly” style, portable radio controllers shall be provided. Each station shall include:
a. Independent, paddle style rate-control switches for each drive.
b. Keyed, on-off switch.
c. Horn control.
d. Dead-man switch.
2. The two radio control stations shall be configured in a “pitch & catch” configuration.
3. Controllers shall be provided with spare battery and a battery charger.

C. Drive Control
1. The control switches shall ensure smooth operation throughout the entire speed range as well as load spectrum.
2. A micro position selector switch should be added for fine positioning of all motions.
3. The following faults shall set the drum brake:
a. Drum Over-speed Detection.
b. Wire Rope Mis-Spooling Detection.
c. Overload Detection.
d. Actuation of the Power Circuit Upper Limit Switch.
e. Phase Loss/Reversal/Under-voltage/Imbalance Protection.
f. A Seismic Event.
g. Actuation of the Emergency Stop or Power-Off Button.

D. Load Limiting
1. The Crane shall be equipped with adjustable load limiting set-points. The load limiting device shall stop the hoisting operation and activate an alarm light and horn (1 sec) on the Crane when the set-point has been exceeded. The alarm light shall be manually reset and the reset shall only allow for lowering the load.
2. The controls shall require a keyed reset to restart the Crane once the drum brake has been set due to all causes except an emergency stop.

E. Load Readout
1. The Supplier shall provide a ”scoreboard” readout of the Crane load on the North end truck. The readout shall be sized for easy reading at a distance of 100 feet. The accuracy of the readout should be +/- 5 to 8% of the load.

2.7 MATERIALS

A. Cast Materials
1. Cast iron and cast aluminum are unacceptable for use in any load-bearing component.

B. Coating Requirements

1. Portions of the Crane that are not corrosion resistant shall be painted in accordance with NOG-3100, Coating Service Level II.
2. All painted surfaces shall receive proper metal preparation and cleaning prior to paint application. As a minimum, SSPC SP3 is acceptable to ensure good paint adhesion. A rust inhibiting chromatic free primer coat shall be applied to an average drift film thickness (DFT) of 1.5 to 2.0 mils. This shall be followed by a finish coat of lead free oil base industrial enamel applied to a DFT of 1.0 to 1.5 mils. Finish color will be safety yellow for crane bridge unit and manufacturer's standard color chosen by the architects for trolley unit.

C. Threaded Fasteners
1. All threaded fasteners that have the potential to fall to the highbay floor shall be installed utilizing thread locking fluid or staking to prevent loosening during crane operation. Lock washers shall not be utilized.

D. Certification of Materials and Components:
1. The Supplier shall classify all materials shown on the subassembly drawings as either critical load bearing or non-load bearing. Load bearing materials shall be identified on the bills of material with an easily recognized symbol. Certification of chemical and physical properties is required for load bearing materials. A certificate of compliance is required for non-load bearing materials. Components in the load path (e.g., hooks, wire rope) shall have the inspections and tests required by ASME Table NOG 7200-2 performed. For purchased items such as gearboxes, bearings, brakes, and other components, the manufacturer's certificate of compliance/conformance will be acceptable.

2.8 MAINTENANCE

A. Component Accessibility
1. All components shall be mounted to allow easy access for maintenance, testing and configuration. Cabinet doors shall be easily removable or be capable of being fully opened to allow unobstructed access to all components inside. Control consoles, panels, and displays shall have provisions to allow access to any component that could require maintenance, repair or replacement.

B. Maintenance Manual
1. The Supplier shall provide a Maintenance Manual for the Crane. The manual shall describe all routine operations and inspections required to maintain the Crane for the full life of the facility (50 years).
2. Troubleshooting and repair instructions are to be provided.
3. Preventative maintenance and lubrication schedules are to be provided.

C. Spare parts
1. The Supplier shall provide a recommended Spare Parts Inventory Document for the proposed Crane. The development of a spare parts inventory shall consider such factors as critical nature of the component, reliability of the component, availability, and lead time for replacement.

D. Pull Points
1. The Supplier shall provide structural attachment points (e.g., eyes or rings) on each side of the bridge and trolley to enable the Crane to be moved with manual hoists in the event of drive failures.

E. Walkway
1. A full-length drive side walkway shall be furnished within the requirements of ASME B30.2. The walkway shall be furnished with toe board, handrail, and checkered plate floor. The walkway shall be furnished with a chain access gate. The final location of the walkway access gate shall be determined upon review of the Seller's drawings.

2. The walkway shall be arranged to provide a means of safe direct access to the trolley to allow for maintenance of all hoist and trolley components. A trolley access platform shall be provided if required for access to the rear of the trolley.
3. The walkway shall provide a minimum of 30 inches of clearance in front of all electrical enclosures.

F. Lighting
1. Four (4), 400W mercury vapor lights are to be mounted to the underside of the crane to overcome the shadow cast by the crane.

2.9 NAMEPLATES

A. A corrosion resistant nameplate shall be attached to each major item of the cranes and shall show the following information:
1. Owner's Purchase Order and Equipment Tag Numbers.
2. Manufacturer's Name
3. Manufacturer's Serial Number
4. Rated Capacity in Tons

B. A Nameplate Drawing shall be submitted for Owner's approval.

PART 3 - EXECUTION

3.1 PACKAGING AND SHIPPING

A. The Supplier shall submit a Packing, Shipping and Handling Plan for Purchaser approval. The Crane shall not be packed or shipped prior to Purchaser approval.

3.2 INSTALLATION

A. The Supplier shall provide on-site assistance during the installation and testing of the Crane

B. The Supplier shall prepare a Recommended Installation Procedure. This procedure will be incorporated into the Purchaser's final installation procedure.

3.3 TESTING AND INSPECTION REQUIREMENTS

A. The Supplier shall submit a Test and Inspection Plan that ensures full compliance of the equipment with the requirements of this specification. The Purchaser will approve the plan, including designated hold/witness points. Upon approval, it shall constitute a part of this specification and shall be implemented by all responsible personnel involved in the manufacturing, inspection or testing of items covered by this specification.

B. All tests shall be performed according to written Test Procedures referenced in the Test and Inspection Plan. The Purchaser will review and approve all Seller test procedures and data sheets to verify adequacy of the test results. Seller shall document all inspection and test results in Inspection and Testing Reports. These reports shall be submitted to the Purchaser for evaluation and approval.

C. Inspections shall include a "two-block" test in accordance with NUREG-0554 Section 8.3.
1. Factory Inspection and Testing
a. Inspection and testing requirements applicable during manufacturing of components shall be in accordance with ASME NOG-1 section NOG-7000 and Table NOG-7200-1. The Crane shall be fully assembled at the Supplier's facility prior to shipment. The Supplier shall demonstrate the emergency load lowering capability of the main hoist, including a loss of power emergency. During shop testing, the emergency drum brakes shall be "worn in" in accordance with the drum brake manufacturer's instructions. The main hoist

load cell weighing system shall be tested to ensure it operates accurately and properly.

2. Receiving Inspection
   a. The Supplier shall provide a Receiving Inspection Plan in accordance with ASME NOG-1, NOG-7311.1 for use by the Purchaser at the time of receiving.
3. Installation Inspection
   a. The Purchaser in accordance with the requirements and ASME NOG-1, Section NOG-7410 shall perform installation inspection of the Crane and site.
4. Preoperational Inspection and Testing
   a. The Purchaser in accordance with the requirements and ASME NOG-1, NOG-7420 shall perform preoperational field testing of the Crane. Preoperational testing shall be part of the overall Test and Inspection Plan. The preoperational test program shall include a 125% (62.5 ton) load test. The load test shall be certified in accordance with ASME NOG-1, NOG-7424.
5. Qualification for Permanent Plant Service
   a. The Crane shall be recertified for use in accordance with the requirements and ASME NOG-1, NOG-7500. The Purchaser will perform recertification tests and inspections with technical assistance from the Supplier.

3.4 QUALITY ASSURANCE

A. The Crane shall be designed, built, delivered and installed in accordance with a Quality Assurance program compliant with 10CFR50 Appendix B and ASME NQA-1.
   1. Non-Conforming Items
      a. The Seller may use its own nonconformance program to identify, report, and recommend disposition of all non-conformances, but disposition that would leave any remaining nonconformity must be submitted to the Purchaser for approval. The Request should identify the affected items(s) by name and serial number, citing the drawing/ specification number and revision number containing the specific requirement that has not been met. It should state the number of nonconforming items being reported. The request should include a description of the nonconformity, identifying requirement(s) not met. The supplier may attach a description of the cause, and a corrective action plan and schedule if pertinent.
      b. The issuance and acceptance of such a request in no way limits or affects the warranty provision of the Agreement. Such a request shall not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the Agreement.
   2. Supplier Requested Deviations
      a. The Seller may propose deviations from the specifications, drawings, or other technical requirements of this procurement. Where time is a consideration, the Seller may communicate the proposed deviations or changes directly to the engineer of technical lead with a copy to the Purchaser's buyer. The engineer or technical lead will evaluate the technical aspects and recommend to the Purchaser, who will communicate acceptance or disapproval to the Seller. The request should identify the affected items, drawing/specification number and revision number, a description of the proposed deviation, and the justification for it.
   3. Certificate of Compliance
      a. The Supplier shall submit a certificate of compliance for the Crane stating that design and fabrication of the Crane is in accordance with applicable standards, such as CMAA No. 70. Certificate shall identify the crane by serial number.

3.5 DOCUMENTATION

A. The Supplier shall develop, deliver and store records in accordance with NOG-1, NOG-7600.

1. Records Storage by the Supplier
   a. The Supplier shall maintain records in accordance with ASME NOG-1, NOG-7615. Final verification of document requirements shall be performed in accordance with ASME NOG-1, NOG-7260.
2. Documentation Submitted to the Purchaser
   a. Records and documents shall be generated, stored and submitted in accordance with ASME NOG-1, NOG-7600. Drawings, calculations and other engineering documents developed for the Crane are subject to a single review and approval cycle by the Purchaser prior to implementation of services associated with such documents. Review and/or approval by the Purchaser does not relieve Supplier's responsibility for providing accurate design engineering documents in accordance with the requirements of this specification.

END OF SECTION 14631